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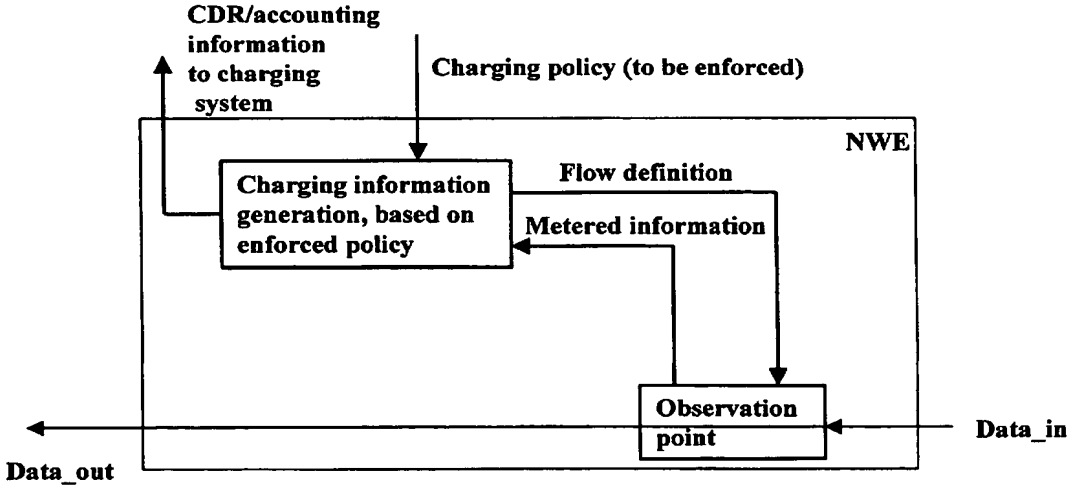
(54) Title: METHOD FOR CHARGING OF DATA REACHING A NETWORK ELEMENT OF A COMMUNICATION NETWORK DURING A DATA SESSION



(57) Abstract: The present invention proposes a method for charging of data reaching a network element of a communication network during a data session, the data session comprising a plurality of data flows, with each flow being distinguishable by a set of flow parameters, the method comprising the steps of: enforcing a charging policy at the network element to be applied to said data, wherein said charging policy defines charging rules per flow; observing said data reaching said network element and detecting at least one flow of data; and matching said detected flow of data to an enforced charging policy, applying said matching charging policy to said flow, thereby generating charging information. Also, the present invention concerns a method for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session. Additionally, corresponding devices are concerned by the present invention.

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TITLE OF THE INVENTION

Method for charging of data reaching a network element of a communication network during a data session

FIELD OF THE INVENTION

The present invention relates to a method for charging of data reaching a network element of a communication network during a data session, and correspondingly to a method for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session.

BACKGROUND OF THE INVENTION

Recently, communication networks have penetrated more and more in every day life and are adopted by subscribers for more and more services such as phone calls, data transmission and the like. Also, so-called value added services are implemented using communication networks.

With the increasing number of possible services available for subscription in communication networks, also new network types and/or subnetworks are emerging, while interoperability therebetween is still given.

In view of this variety of services to be subscribed and different networks/subnetworks used by subscribers when using their terminals, network operators are facing challenges in implementing new value added services based on messaging applications over e.g. GPRS (General Packet Radio Services).

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charging policy defines charging rules per flow; observing said data reaching said network element and detecting at least one flow of data; and matching said detected flow of data to an enforced charging policy, applying said matching charging policy to said flow, thereby generating charging information.

According to favorable further developments of the method,

- the method comprises a step of forwarding said generated charging information to a charging system of the communication network;

- enforcing is performed upon start-up of the network element;

- enforcing is performed upon activation of the data session;

- enforcing is performed dynamically during the life-time of the data session;

- upon enforcing said charging policy, data volume counters and/or time counters are initialized.

- said data flows are Internet Protocol based packet data flows, and said flow parameters comprise at least one of an IP header field, a transport header field, and an application level information;

- said charging policy comprises at least one flow parameter, and at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication;

According to a further aspect of the present invention, the above object is for example achieved by a method for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session, the method comprising the step of: creating a plurality of charging policies, each comprising at least one flow parameter, and at least one of a

- said enforcing means are responsive to activation of the data session to perform the enforcing;
- said enforcing means are dynamically performing the enforcing during the life-time of the data session;
- the device further comprises initialization means adapted to initialize data volume counters and/or time counters responsive to enforcing said charging policy;
- said data flows are Internet Protocol based packet data flows, and said flow parameters comprise at least one of an IP header field, a transport header field, and an application level information;
- said charging policy comprises at least one flow parameter, and at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication.

Furthermore, according to the present invention, the above objects are for example achieved by a device for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session, the device comprising creation means adapted to create a plurality of charging policies, each comprising at least one flow parameter, and at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication, selection means adapted to select a charging policy based on offered services and subscriber information, and distribution means adapted to distribute said selected charging policy to at least one network element.

According to favorable further developments a charging policy is selected for a type of a network element.

a network element of a communication network during a data session.

Fig. 3 shows details of a device for charging of data reaching a network element of a communication network during a data session.

DETAILED DESCRIPTION OF THE EMBODIMENTS

In brief, with the proposed charging mediation functionality, through a policy management interface the operator is allowed to create and manage charging policies. A charging policy decision logical function selects the appropriate charging policy according to the offered services and relevant subscription information. Via the charging policy control interface, the charging policy is sent to one or more network elements where it is locally enforced to relevant processes. Charging policies for access network devices such as GGSN are being considered but it can also apply to other network elements depending on the relevant needs such as core network elements, as will be set out in greater detail herein below.

In order to create charging policies for access network devices, a flow definition such as an IP flow definition is required. An IP flow, or any other flow which need not necessarily be based on the Internet Protocol IP, is a set of packets passing an observation point in the network during a certain time interval A set of IP flows (one or more) can correspond to the usage of a certain application or service differing from an application flow. There are services which use single IP flow or services which use more than one IP flows such as for example streaming or rich call. All packets belonging to a particular flow have a set of common properties derived from the data contained

Among the items input as operator input there are at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication, which is/are mapped and/or assigned to a corresponding flow distinguished from other flows by a set of packet flow attributes. For example, charging/accounting type is defined by an indication whether online accounting (prepaid, hot billing) or off-line accounting is to be effected. As accounting event triggers are possible (either one or several in combination): QoS changes, tariff changes, time thresholds and/or volume thresholds. Charging metrics include a volume metering (which is On/Off), a time metering (which is On/Off), a QoS metering (which is On/Off) (either one or several in combination). Further, tariffing comprises an indication of the tariff class and a co-assigned value of the tariff.

The above input is supplied by the operator, e.g. „manually„ or as a preconfigured file.

As regards properties of the packets defining a flow, these properties may also be input by the operator as the above items. Nevertheless, the properties may also be supplied as a result obtained at an observation point or measurement device monitoring data flows or directly by an application. Irrespective of whether input manually or as a result of a measurement or by an application, the properties/attributes of the packets defining a flow may comprise for example source address and port; destination address and port; Layer 3 Protocols used (Network protocols); TOS (IPv4 Type Of Service); Traffic Class (IPv6); Flow Identifier; URL (if needed); Destination Classification such as internal / partner / external (e.g. „Sonera„, partner or external).

part of a charging policy delivered to the core network elements (in addition or alternatively to those mentioned above in connection with access network elements): charging/accounting type (online accounting (prepaid, hot billing), off-line accounting), accounting event triggers (URL, time change, service class change, add/remove media component, Session Initiated Protocol SIP Method 1 with list of messages, SIP Method n with list of messages), charging metrics (content size (On/Off), time metering (On/Off), number of transactions (On/Off), tariffing (tariff class and value).

Charging policies could be enforced to core network elements such as CPS to indicate which event, sequence of events or actions could trigger accounting actions.

Thus, with regard to the method for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session, the foregoing made clear that the method comprises the steps of creating a plurality of charging policies, each comprising at least one flow parameter, and at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication, selecting a charging policy based on offered services and subscriber information, and distributing said selected charging policy to at least one network element.

Also, a respective charging policy is for example selected for a type of a network element and distributed to all network elements of said specific type. In case of access network elements such as GGSN, enforced charging policies for Access Network Devices such as GGSN define the triggering detection points for a chargeable flow.

charging mediation functionality are enforced, i.e. rendered valid for charging purposes. Thus, based on the enforced charging policy at the network element and the observed flow parameters (metered information), charging information is generated and forwarded, e.g. as a call detail record CDR (also referred to as a Charging Data record) or as a RADIUS/DIAMETER accounting information (Remote Authentication Dial In User Service (RADIUS)), to a charging system of the network.

Stated in other words, the present invention concerning a method for charging of data reaching a network element of a communication network during a data session, the data session comprising a plurality of data flows, with each flow being distinguishable by a set of flow parameters, comprises the steps of enforcing a charging policy at the network element to be applied to said data, wherein said charging policy defines charging rules per flow; observing said data reaching said network element and detecting at least one flow of data; and matching said detected flow of data to an enforced charging policy, and applying said matching charging policy to said flow, thereby generating charging information.

Of course, there is also conceived a forwarding of said generated charging information to a charging system of the communication network.

The charging policy for access network devices defines, in case of an IP flow as an example of a flow of a session such as a PDP context, the IP flow specification that must be distinguished upon being measured as well as the relevant accounting action to be taken upon being distinguished. A charging policy can for example suppress

It is further to be understood that upon enforcing said charging policy, data volume counters and/or time counters are initialized at the network element, more specifically, at the charging information generation functionality. Even though said data flows are not restricted to Internet Protocol based packet data flows, and in case of IP based data flows, said flow parameters comprise at least one of an IP header field, a transport header field, and an application level information.

More particularly, as regards the flow parameters to be observed, concerning

- IP Header Fields, the measuring device is capable of separating the flows by the following fields of the IP header as indicated: Source IP address, Destination IP address, Transport protocol type (Layer 4 protocol type), IP version number, TOS (IPv4 Type of Service), Traffic Class (IPv6);

- Transport Header Fields, the measuring device is capable of separating flows by the port numbers of the transport header in case of Transmission Control Protocol TCP or User Datagram Prototcol UDP being used as transport protocol. Both source and destination port number are supported for distinguishing flows, individually as well as in combination;

- application level information carried as payload within the data packets (e.g. URL), this information can also be used as parameter to distinguish data flows (at least one data flow).

An enforced charging policy comprises, as stated further above at least one flow parameter as mentioned above, and at least one of a charging/accounting type, an accounting event trigger, a charging metrics, and a tariffing indication (explained above).

generation means, responsive to said application means, adapted to generate charging information.

The charging policy is received at the enforcing means where it is rendered valid to be enforced and e.g. buffered in a memory (not shown). The enforcing means informs the matching means of the policy. The matching means in turn supplies a flow definition (to be detected) to the observation means, which returns information on detected flow definitions to the matching means. In case the flow definitions (the detected and the one to be detected) are matching (identical), the matching means triggers the application means to apply the enforced policy to metered information received from the observation means. The application means then forwards the available information to the generation means where the charging information as such is generated.

In addition, as shown in Fig. 3, the device further comprises forwarding means adapted to forward said generated charging information from the generation means to a charging system of the communication network.

Similarly as explained in connection with the corresponding method, said enforcing means are responsive to a start-up of the network element to perform the enforcing, or said enforcing means are responsive to activation of the data session to perform the enforcing, or said enforcing means are dynamically performing the enforcing during the life-time of the data session.

Also, the device further comprises initialization means (not shown) which are adapted to initialize data volume counters and/or time counters responsive to enforcing said charging policy.

charging policy defines charging rules per flow; observing said data reaching said network element and detecting at least one flow of data; and matching said detected flow of data to an enforced charging policy, applying said matching charging policy to said flow, thereby generating charging information. Also, the present invention concerns a method for supplying a network element with a charging policy to be enforced at said network element for charging of data reaching said network element of a communication network during a data session. Additionally, corresponding devices are concerned by the present invention.

While the invention has been described with reference to a preferred embodiment, the description is illustrative of the invention and is not to be construed as limiting the invention. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims.

Claims

1. A method for charging of data reaching a network element of a communication network during a data session,
the data session comprising a plurality of data flows, with each flow being distinguishable by a set of flow parameters,
the method comprising the steps of:
enforcing a charging policy at the network element to be applied to said data, wherein said charging policy defines charging rules per flow;
observing said data reaching said network element and detecting at least one flow of data; and
matching said detected flow of data to an enforced charging policy,
applying said matching charging policy to said flow, thereby generating charging information.

2. A method according to claim 1, further comprising a step of
forwarding said generated charging information to a charging system of the communication network.

3. A method according to claim 1, wherein
enforcing is performed upon start-up of the network element.

4. A method according to claim 1, wherein
enforcing is performed upon activation of the data session.

5. A method according to claim 4, wherein
enforcing is performed dynamically during the life-time of the data session.

a charging policy is selected for a type of a network element.

11. A device for charging of data reaching a network element of a communication network during a data session, the data session comprising a plurality of data flows, with each flow being distinguishable by a set of flow parameters,
the system comprising:
enforcing means adapted to enforce a charging policy at the network element to be applied to said data, wherein said charging policy defines charging rules per flow;
observation means adapted to observe said data reaching said network element and detecting at least one flow of data; and
matching means adapted to match said detected flow of data to an enforced charging policy,
application means adapted to apply said matching charging policy to said flow, and
generation means, responsive to said application means, adapted to generate charging information.

12. A device according to claim 11, further comprising forwarding means adapted to forward said generated charging information to a charging system of the communication network.

13. A device according to claim 11, wherein said enforcing means are responsive to a start-up of the network element to perform the enforcing.

14. A device according to claim 11, wherein said enforcing means are responsive to activation of the data session to perform the enforcing.

- selection means adapted to select a charging policy based on offered services and subscriber information, and

- distribution means adapted to distribute said selected charging policy to at least one network element.

20. A device according to claim 19, wherein

a charging policy is selected for a type of a network element.

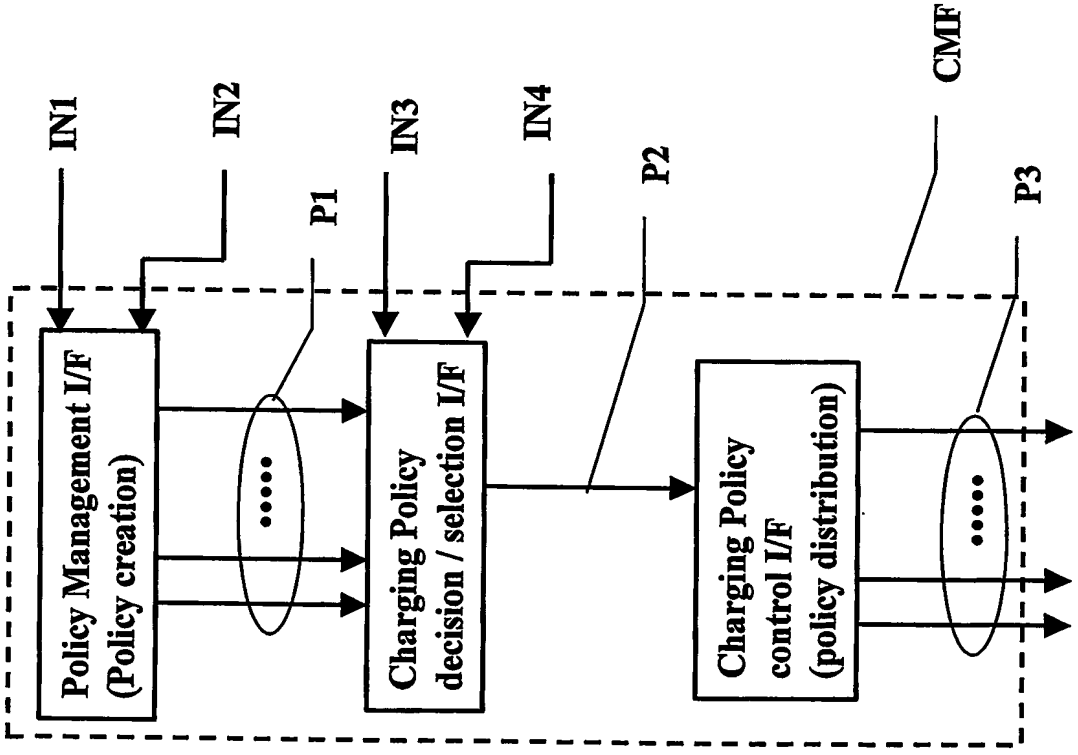
IN1
IN2
IN3
IN4
P1
P2
P3
CMF
Policy Management I/F (Policy creation)
Charging Policy decision / selection I/F
Charging Policy control I/F (policy distribution)

Fig. 1

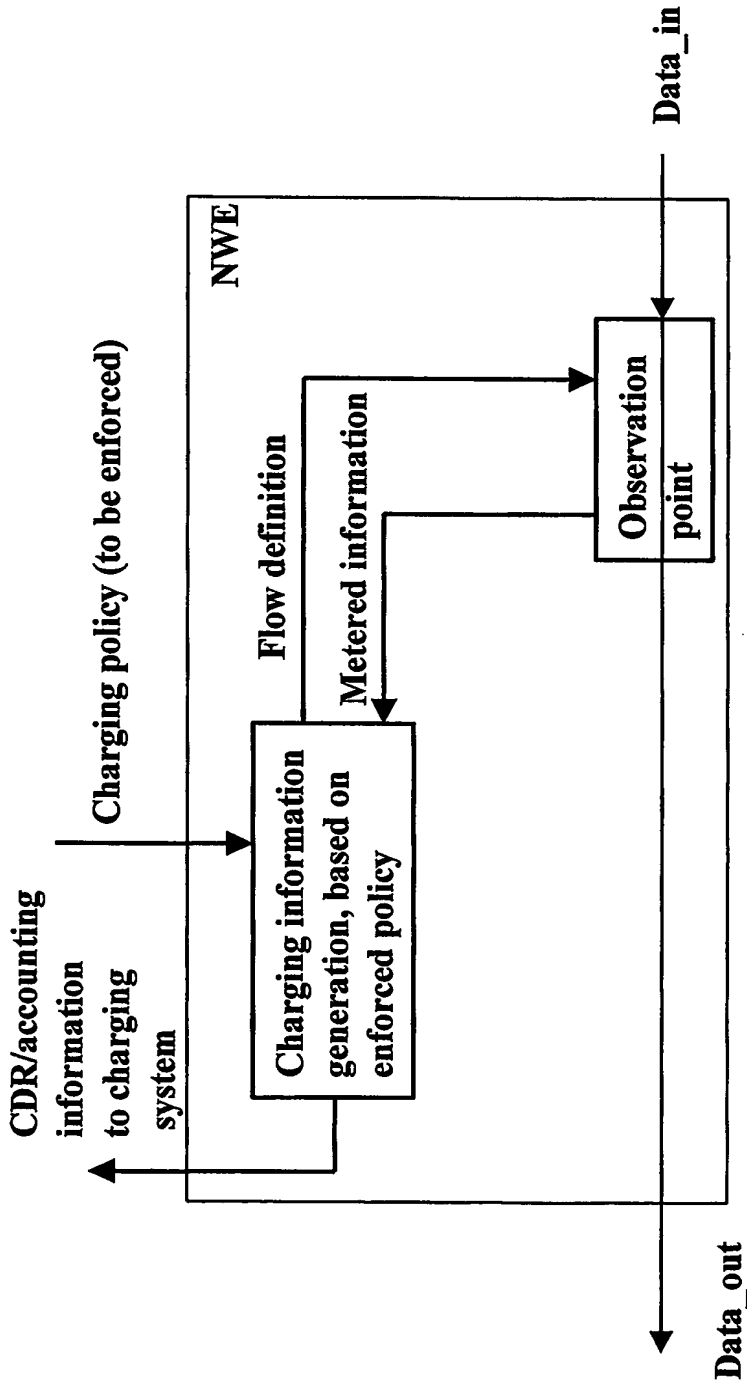
Data_in
NWE
Observation point
Flow definition
Metered information
Charging policy (to be enforced)
Charging information generation, based on enforced policy
CDR/accounting information to charging system
Data_out

Fig. 2

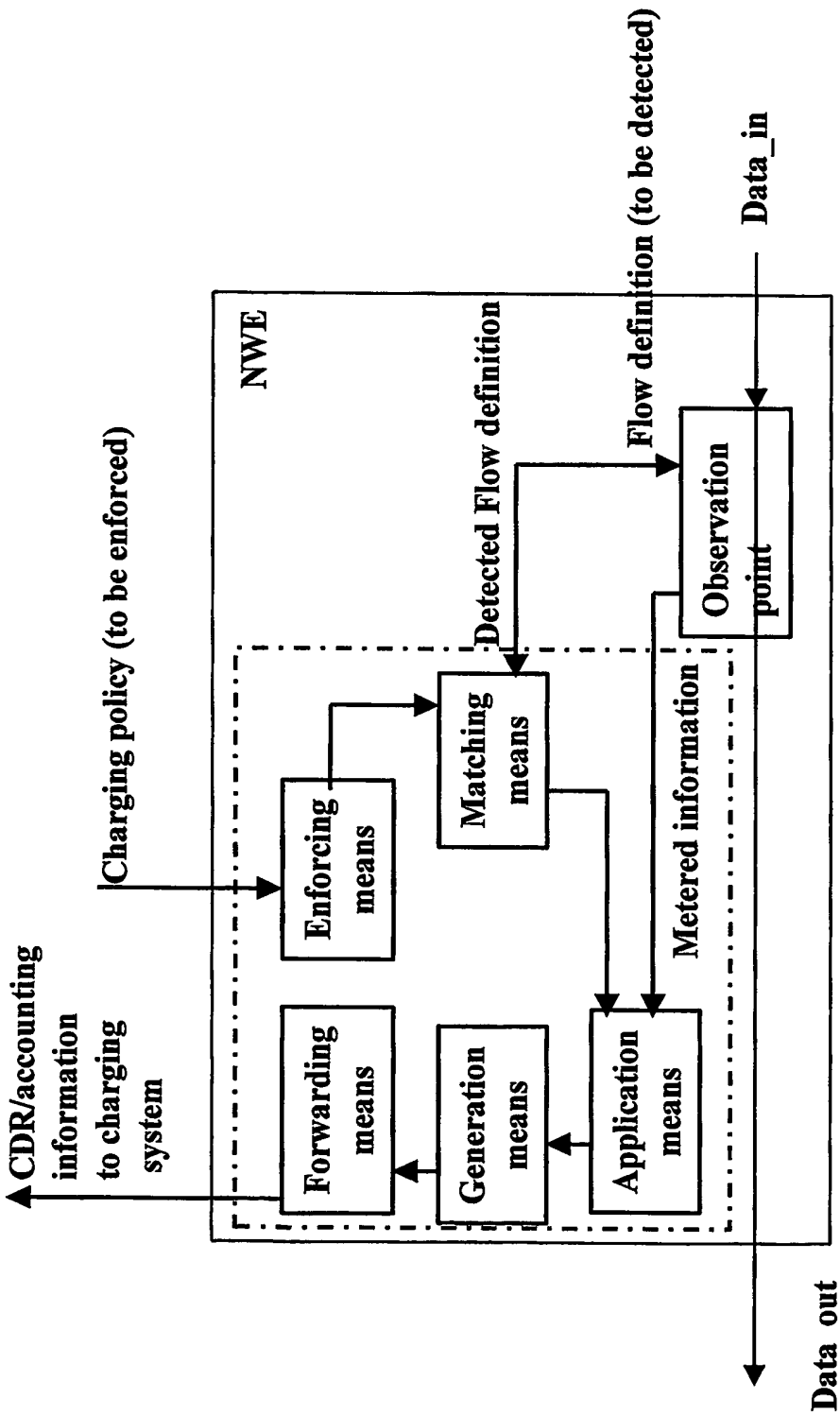
NWE
Charging policy (to be enforced)
Detected Flow definition
Flow definition (to be detected)
Data_in
Enforcing means
Matching means
Observation point
Metered information
CDR/accounting information to charging system
Forwarding means
Generation means
Application means
Data_out

Fig. 3